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Patent- og Varemærkestyrelsen
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PATENT- OG VAREMÆRKESTYRELSEN

TITLE

A Dressing

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to wound dressings being capable of releasing one or more therapeutic agents to a wound.

2. Description of the Related Art

Dressings being capable of releasing active agent to a wound are well-known in the art. Usually the release from these dressings is dependent on the amount of wound exudate contacting the dressing. This often results in a massive release of active agent in a short period, and not in an amount being adapted to the actual need of the wound.

International Patent Application No. WO 03/47643 discloses a dressing for wound treatment; the dressing comprises a therapeutic agent and a barrier layer, which separates the therapeutic agent from the wound fluid. The barrier layer comprises a substrate being degradable by specific proteolytic enzymes in the wound fluid. Possible applications of this dressing are limited as the function of the dressing is dependent upon the presence of the specific enzymes.

SUMMARY OF THE INVENTION

One object of the invention is to provide a dressing being capable of providing a target release of one or more therapeutic agents to a wound.

The difficulties associated with the healing of chronic wounds may be caused by a number of factors. Typically, problems may be bacterial infections, presence of necrotic tissue and/or slough etc. One wound may suffer from more than one of these factors, one end of the wound may have severe necrosis and the other end

may suffer from infection. In order to treat such wound more effectively there is a need for a dressing being capable of handling these factors.

Detailed Description of the Present Invention

The invention relates to a wound dressing for targeted release of one or more therapeutic ingredients wherein the therapeutic ingredients are contained in liposomes, said liposomes comprising releasing means being triggered by a wound constituent and thereby releasing the therapeutic ingredients of the liposomes.

By incorporating therapeutical ingredients into liposomes, an increased flexibility of the design of the dressing may be achieved. Liposomes are a drug delivery system based on small vehicles of lipid bilayers. Liposomes have been extensively investigated as drug carriers for skin delivery and parenteral delivery for many drugs. The liposomes form a very stable membrane thus giving a good protection of the active substance. It has surprisingly been found that by incorporating liposomes into wound dressings a target drug delivery can be achieved by site specific delivery of therapeutic substances.

The dressing of the invention provides target release of a suitable therapeutic agent. The problems regarding chronic wounds may be identified by individual indicators present in the wound. Depending on the type of problem related to the wound, the wound constituent may be any biological constituent being present in a chronic wound.

Chronic wounds may be identified by individual indicators present in the wound, e.g. specific proteins or antigens. These may only be present in chronic non-healing wounds and are sometimes a problem in the wound and thereby the target of the therapeutic agent. Sometimes the said indicators are present due to underlying defective condition.

The liposomes comprise a releasing means, said releasing means may be triggered to release the therapeutic agent when exposed to specific wound components. The said wound constituent may be in the wound exudates or bound to the diseased cells in the wound.

The releasing means may be triggered by a specific wound constituent – only present in chronic wounds – and may only be present in specific types of chronic wounds. The wound constituent may be a protein or another type of chemical or biological constituent.

The protein may be an enzyme. The enzyme may only be present in chronic wound or present in elevated levels compared to healthy human tissue.

The wound constituent may be able to degrade the bilipid layer of the liposomes, or it may trigger means on the surface of the liposomes that induces transport of the therapeutical ingredients over the membrane and thus releasing it to the wound.

Liposomes can be custom made such that they are degraded due to the presence of the above-mentioned indicators.

The therapeutic ingredient may be a pharmaceutical agent, such as bacteriostatic or bactericide compounds, e.g. iodine, iodopovidone complexes, chloramine, chlorohexidine, silver salts, zinc or salts thereof, tissue-healing enhancing agents, e.g. RGD tripeptides, growth-factors and the like, enzymes for cleansing of wounds, e.g. pepsin, trypsin and the like, enzyme controlling agents such as protease controlling agents, pain relieving agents, or agents having a cooling effect.

The therapeutic agent may be an enzymatic agent. It may be an enzyme promoting wound healing by degrading undesired elements being present in the

wound, such as non-viable tissue, non-proliferating cells, wound slough expressed from the immune response of the body due to bacterial activity.

In one embodiment the therapeutic ingredient is a proteolytic enzyme. Proteolytic enzymes are suitable for degrading necrotic tissue and slough and thereby preparing the wound bed for a more effective healing. Examples of suitable protecolytic enzymes are papain, bromelain, trypsin, collagenase, krillase, streptokinase, streptodornase, fibrinolysin, deoxyribonuclease, sutilains, etc.

In one embodiment the therapeutic ingredient may be a protease inhibitor. The release of a protease inhibitor directly into the wound may ensure a very efficient inhibition of unwanted protease activity. The liposomes may be constructed so that they can diffuse to the cells deep in the wound where the inhibitors are needed. The liposomes may exhibit an intelligent release so that the inhibitor is only released, in the correct amount, when the protease level is higher than normal. It may be specific proteases that trigger this release. The release may be obtained by using special polymers in the liposomes. The released inhibitor may be a synthetic small molecule, such as peptidmetic or an inhibitor of biological origin, such as antibodies and naturally occurring inhibitors, TIMP's and α-1-antitrypsin, AAT, Elafin, Tetracycline, Secretory Leukocyte Protease Inhibitor (SLPI).

Claims

1. A wound dressing for targeted release of one or more therapeutic ingredients wherein the therapeutic ingredients are contained in liposomes, said liposomes comprising releasing means being triggered by a wound constituent and thereby releasing the therapeutic ingredients of the liposomes.

2. A wound dressing according to claim 1, wherein the therapeutic ingredient is a protease controlling agent.

3. A wound dressing according to claim 1, wherein the therapeutic ingredient is an antibacterial agent.

4. A wound dressing according to claim 1, wherein the therapeutic ingredient is a pain relieving agent.

5. A wound dressing according to claim 1, wherein the therapeutic ingredient is an enzymatic agent.

6. A wound dressing according to claim 1, wherein the therapeutic ingredient is a proteolytic enzyme.

7. A wound dressing according to claim 1, wherein the proteolytic enzyme is papain.

8. A wound dressing according to any of claims 1-7, wherein the wound constituent is a biological constituent being present in a chronic wound.

9. A wound dressing according to claim 8, wherein the wound constituent is present in the wound exudates.

Abstract

A Dressing

A wound dressing for targeted release of one or more therapeutic ingredients wherein the therapeutic ingredients are contained in liposomes, said liposomes comprising releasing means being triggered by a wound constituent and thereby releasing the therapeutic ingredients of the liposomes.